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THE ORIENTAL INSTITUTE EXCAVATIONS AT MUREYBIṬ, SYRIA: PRELIMINARY REPORT ON THE 1965 CAMPAIGN

PART III: THE PALEOBOTANY

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INTRODUCTION

IN this report the results of the botanical study of a series of samples collected during the excavation of Tell Mureybiṭ, in northern Syria, will be discussed. This excavation was carried out under the direction of Dr. Maurits N. van Loon in the autumn of 1965.[1] Radiocarbon determinations suggest that prehistoric habitation of Mureybiṭ lasted from *ca.* 8,050 to 7,550 B.C., when calculated with a C^{14} half-life value of 5,570 years. With a half life value of 5,730 years these ages are about 8,350 and 7,825 B.C. respectively.

From a total of twenty-two samples, two turned out to be barren of seeds. Most of the samples were made up of charcoal fragments within which greater or smaller numbers of carbonized seeds were present. The carbonized remains had been recovered by means of a flotation technique from large samples of cultural fill taken at various levels by the excavator. The samples, marked "seeds," consisted of charred grains which had been recognized with the naked eye in a section or on a surface. In the spring of 1967, a second series of samples was collected and floated by Mr. S. Bottema and the author. These samples could not yet be studied in the laboratory, but a preliminary check in the field indicated that it is unlikely that they will appreciably change the picture provided by the seed analysis of the samples collected in 1965.

The results of the paleobotanical study are shown in Table 1. In addition to the old and new designations of the excavator, the samples are indicated with a serial number. Only seeds which could be attributed to a family, genus, or species with a fair degree of certainty are listed. A number of seeds could not even be identified tentatively. This is partially due to poor preservation and partially to the fact that the author's seed reference collection is not yet sufficiently representative of the Near East.

The author wishes to express his thanks to Messrs. S. Bottema, W. A. Casparie, R. R. Newell, and H. R. Roelink for their help and co-operation.

WILD EINKORN

Among the charred seeds, those of wild einkorn are the most numerous. Two varieties of wild einkorn can be distinguished, *viz.* the small *Triticum boeoticum* Boiss. emend. Schiemann var. *aegilopoides* (Bal.) Schiemann, which is distributed in the Balkans and

[1] M. N. Van Loon, "First Results of the 1965 Excavations at Tell Mureybat near Meskene," *Annales archéologiques arabes syriennes*, 16, Part 2 (1966), pp. 211–17; "The Oriental Institute Excavations at Mureybiṭ, Syria: Preliminary Report on the 1965 Campaign. Part I: Architecture and General Finds," *Journal of Near Eastern Studies*, 27 (1968), 265–82.

PLATE XIII

FIG. 1.—CARBONIZED EINKORN FROM MUREYBIṬ

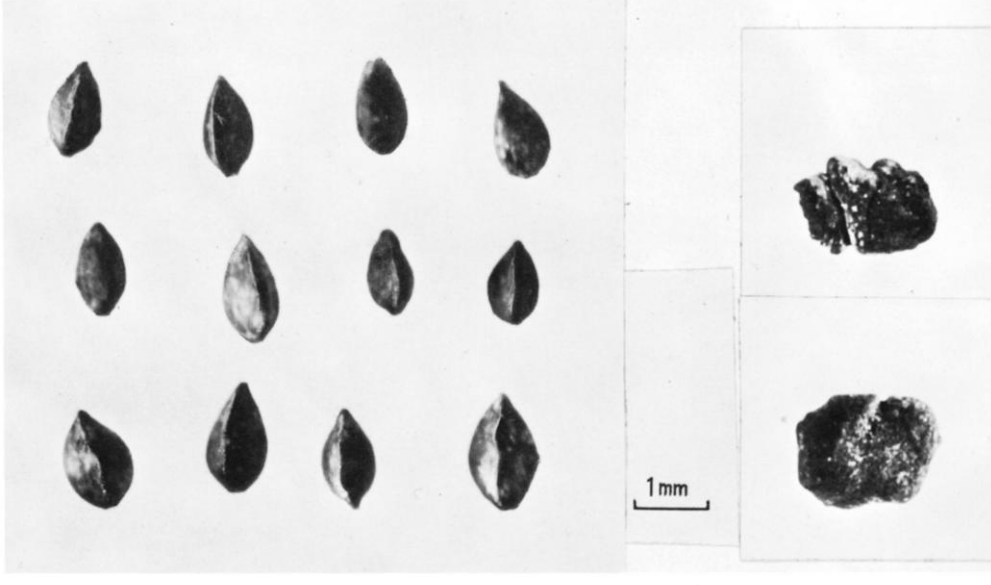

FIG. 2.—LEFT: *Polygonum* CF. VENANTIANUM. RIGHT: *Astragalus* SPEC.

TABLE 1. CARBONIZED SEEDS FROM MUREYBIṬ

Sample number	1	2	3	4	5	6	7	8	9	10
New designation: Operation	P 29	Q 29	Q 29	Q 29	Q 29	Q 30	Q 29	Q 28	R 27	R 27
Stratum	II–V	VIII–X	VIII–X	XI	XIII–XIV	XIII–XIV	XIV	XV	XV	XV
Old designation	II NW③	II NE ③	II NE ③	II NE(2b)	II NE ①	II SE ①	II NE(1b)	I F ②	VI ③	VI (3b) [6]
Triticum boeoticum var. *thaoudar*	1	*ca.* 1250	*ca.* 450	*ca.* 3	*ca.* 3	*ca.* 75	—	½	*ca.* 1	1
Hordeum spontaneum	1/3	*ca.* 9	—	6	2	4	2½	3/4	1/3	1½
Setaria spec.	—	1	—	1	—	2	—	—	1	—
Bromus spec.	—	—	1	—	—	—	—	—	—	—
Gramineae indet.	2	2	—	—	1	—	—	—	1	—
Lens cf. *nigricans*	—	—	—	2	*ca.* 6	1	½	—	3	*ca.* 6
Vicia ervilia	—	—	—	1	3	—	—	—	—	1
Astragalus spec. div.	3	—	—	—	1	1	4	1	2½	3
Leguminosae indet.	—	1	—	5	2½	—	—	—	—	1½
Fragments of *Pistacia*	—	—	—	—	1	—	2	—	2	2
Polygonum cf. *venantianum*	19	5	—	3	6	2	18	3	*ca.* 65	*ca.* 40
Polygonum spec.	—	—	—	—	½	—	—	—	—	—
Silene spec.	4	—	—	1	—	—	—	—	23	8
Chenopodiaceae	—	1	—	—	—	—	3	—	1	1
Galium spec.	—	1	—	1	1	—	—	—	—	—
Micromeria type	—	—	—	—	—	—	—	—	4	—
Papaver spec.	—	—	—	—	—	—	—	—	1	—
Carex spec.	—	—	—	—	—	—	—	—	2	—
Juncus cf. *bufonius*	—	many	—	—	—	—	—	—	—	—

Sample Number	11	12	13	14	15	16	17	18	19	20
New designation: Operation	R 29	R 28	R 29	X 40	X 41	Q 29	Q 30	Q 30	Q 30	Q 30
Stratum	XVI	XVI–XVII	XVII–XVIII	Structure 23	Structure 23	VIII–XII	XI–XII	VIII–XII	X	XI–XII
Old designation	VII ③	I G ③	VII ②	IV ② [1]	V ② [1]	#1 seeds	#2 seeds	#3 seeds	#4 seeds	#5 seeds
Triticum boeoticum var. *thaoudar*	1	1	1/3	½	½	*ca.* 50	12	—	5	3
Hordeum spontaneum	2½	—	1	—	1	5	2½	3	*ca.* 2	*ca.* 1
Setaria spec.	—	—	—	—	1	—	—	—	—	—
Bromus spec.	—	—	—	—	—	—	—	—	—	—
Gramineae indet.	1	—	—	1	—	—	—	—	—	—
Lens cf. *nigricans*	1	—	—	—	—	—	—	—	—	—
Vicia ervilia	—	—	—	—	—	—	—	—	—	—
Astragalus spec. div.	—	—	—	1	1	—	—	—	—	—
Leguminosae indet.	2	—	1	½	1½	—	—	—	—	—
Fragments of *Pistacia*	—	—	—	1	—	—	—	—	—	—
Polygonum cf. *venantianum*	4	—	8	3	11	—	—	—	—	—
Polygonum spec.	—	—	—	—	—	—	—	—	—	—
Silene spec.	2	—	1	—	1	—	—	—	—	—
Chenopodiaceae	1	1	—	—	3	—	—	—	—	—
Galium spec.	1	—	—	—	1	—	—	—	—	—
Micromeria type	—	—	1	—	—	—	—	—	—	—
Papaver spec.	—	—	—	—	—	—	—	—	—	—
Carex spec.	—	—	—	—	—	—	—	—	—	—
Juncus cf. *bufonius*	—	—	—	—	—	—	—	—	—	—

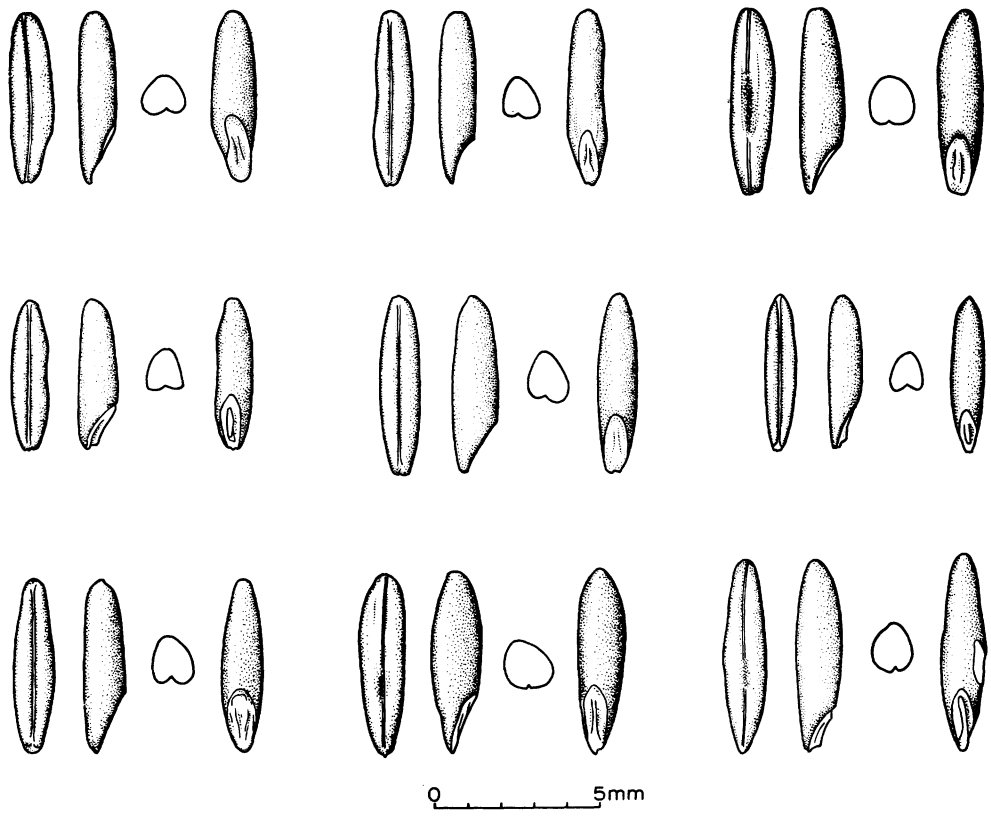

FIG. 3.—*Triticum boeoticum* var. *thaoudar* from Mureybiṭ

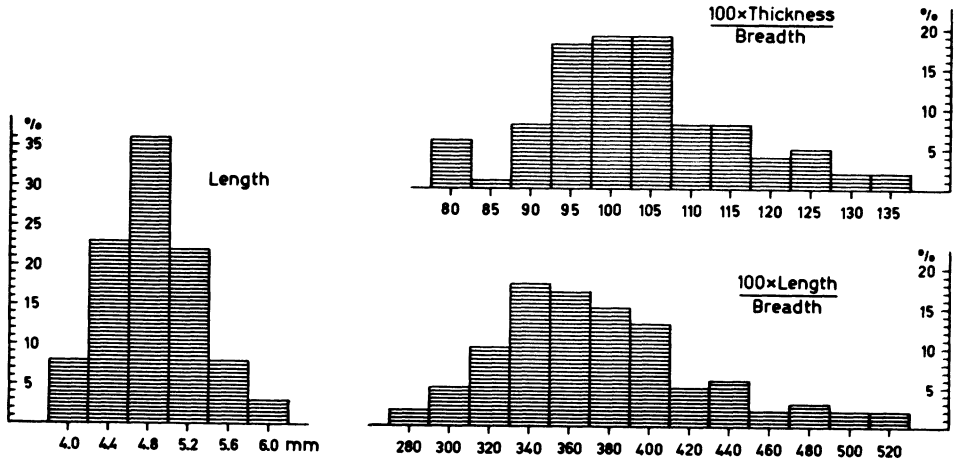

FIG. 4.—Frequency distribution graphs for the length, the L:B index, and the T:B index of Mureybiṭ wild einkorn (number of measured specimens is 100).

western Anatolia, and the much larger var. *thaoudar* (Reut.) Schiemann, which is found in southeastern Turkey, in Iran, and Iraq.[2] In *Tr. boeoticum* var. *aegilopoides* generally one seed develops in a spikelet, whereas the spikelets of the var. *thaoudar* are, as a rule, two-seeded.

The carbonized wild einkorn from Mureybiṭ belongs to the two-seeded variety *thaoudar*. Among the more than 1800 specimens, not one grain characteristic of a one-seeded spikelet was found. In contrast to the grains of the one-seeded wild einkorn, those of the two-seeded variety are not laterally compressed. The slender seeds (Figs. 1 [on Pl. XIII] and 3) are spindle-shaped, showing the greatest breadth in the middle of the grain, while the ends are more or less pointed. The dorsal and ventral sides are longitudinally straight or slightly curved.

From Sample 2, 100 complete specimens have been measured. As the radicle point on most of the grains had not been preserved this was not included in the measurements. The results of the measurements are represented in Table 2 and in Fig. 4, which shows the frequency distributions for the length, the L:B index $\left(\frac{100 \times \text{length}}{\text{breadth}}\right)$, and the T:B index $\left(\frac{100 \times \text{thickness}}{\text{breadth}}\right)$. Table 2 shows likewise the average dimensions of twenty modern grains of *Triticum boeoticum* var. *thaoudar* grown in the experimental garden of the Institute of Plant Breeding at Wageningen (the Netherlands). In the latter measurements, the radicle point and the hairs at the upper end of the grain are not included.

The charred grains are smaller than the modern specimens. Moreover, it is striking that the average thickness of the carbonized grains is only slightly larger than the average breadth, whereas modern specimens are distinctly thicker (higher) than broad. This phenomenon has very likely been effected by the carbonization. In this connection

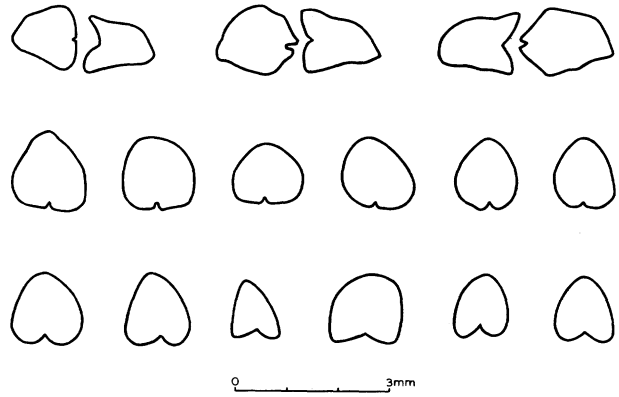

FIG. 5.—Cross-sections of seeds of *Triticum boeoticum* var. *thaoudar*. Upper row: three pairs from spikelets of modern grains. Middle row: carbonized grains with protruding ventral side. Lower row: carbonized grains with intruding ventral side.

[2] J. R. Harlan and D. Zohary, "Distribution of Wild Wheats and Barley," *Science*, 153 (1966), 1074–80.

TABLE 2

DIMENSIONS AND INDICES FOR CHARRED *Triticum boeoticum* var. *thaoudar* FROM MUREYBIṬ AND FOR MODERN SEEDS OF THIS SPECIES

			L	B	T	L:B	T:B
charred seeds	N = 100	min.	3.8	0.9	1.0	286	78
		aver.	4.83	1.30	1.33	376	103
		max.	6.0	1.6	1.7	518	133
modern seeds	N = 20	min.	4.7	1.05	1.3	311	85
		aver.	5.77	1.47	1.62	401	112
		max.	6.65	2.0	2.0	486	152

one can refer to Hopf,[3] who studied the influence of carbonization on the dimensions of wheat and barley grains. For cultivated two-seeded einkorn (*Triticum monococcum* L.) she found a decrease of the length by 5 per cent, an increase of the breadth by 29.5 per cent and an increase of the thickness by 4 per cent after carbonization.

In two-seeded wild einkorn the two grains in one spikelet are not completely identical. As is shown in the cross-sections of modern grains in Fig. 5 (upper row) one of the grains has a protruding and the other an intruding ventral side. The same dimorphism can be observed in the Mureybiṭ charred grains (Fig. 5, middle and lower row). In carbonized grains this difference is generally less clear than in modern specimens. Since through carbonization the grain dilates in breadth, the difference between protruding and intruding ventral side becomes less pronounced and can even disappear entirely.

The large numbers of wild einkorn seeds in a few samples suggest that this wild crop played an important part in the diet of the prehistoric inhabitants of Mureybiṭ. At present wild einkorn is not found in the plain of northern Syria, but it grows in extensive stands in southeastern Turkey, at elevations between 600 and 2,000 m.[4] If about 10,000 years ago the climate of northern Syria was cooler and moister than to-day, wild einkorn could have grown in the vicinity of Mureybiṭ. However, the scarce palynological evidence presently available for the Near East does not support such a hypothesis. The results of the palynological study of lake sediments in the Zagros Mountains of western Iran suggest that during the upper part of the last glaciation the climate in that region was cooler and dryer than at present. After about 12,000 B.C. temperature as well as precipitation would have increased, but it was not until about 4,000 B.C. that humidity reached modern levels.[5] If the Late-Pleistocene climatic succession in the plain of northern Syria was comparable to that in the mountains of western Iran, wild einkorn would not have been present in the vicinity of Mureybiṭ around 8,000 B.C. Consequently, it is likely that this species was harvested in the adjacent part of Turkey, at a distance of at least 100 to 150 km. from this site. This would imply that the inhabitants of Mureybiṭ were not wholly sedentary, but that in late spring and early summer they stayed in more northerly regions.

That wild einkorn could have contributed essentially to the economy of food gatherers is demonstrated by Harlan.[6] On the strength of his experiments in harvesting wild einkorn this investigator arrived at the conclusion that under favorable conditions a

[3] M. Hopf, "Botanik und Vorgeschichte," *Jahrbuch des Römisch-Germanischen Zentralmuseums Mainz*, 4 (1957), 1–22.

[4] Harlan and Zohary, *loc. cit.*

[5] W. Van Zeist and H. W. Wright, "Preliminary Pollen Studies at Lake Zeribar, Zagros Mountains, Southwestern Iran," *Science*, 140 (1963), 65–67; W. Van Zeist, "Late Quaternary Vegetation History of Western Iran," *Review of Palaeobotany and Palynology*, 2 (1967), 301–11.

[6] J. R. Harlan, "A Wild Wheat Harvest in Turkey," *Archaeology*, 20 (1967), 197–201.

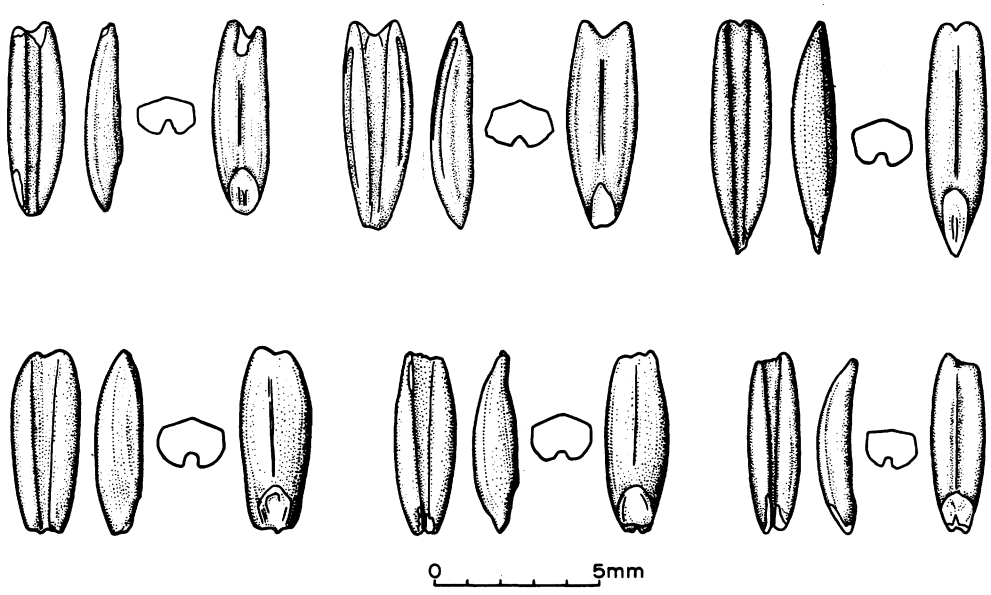

FIG. 6.—*Hordeum spontaneum* from Mureybiṭ

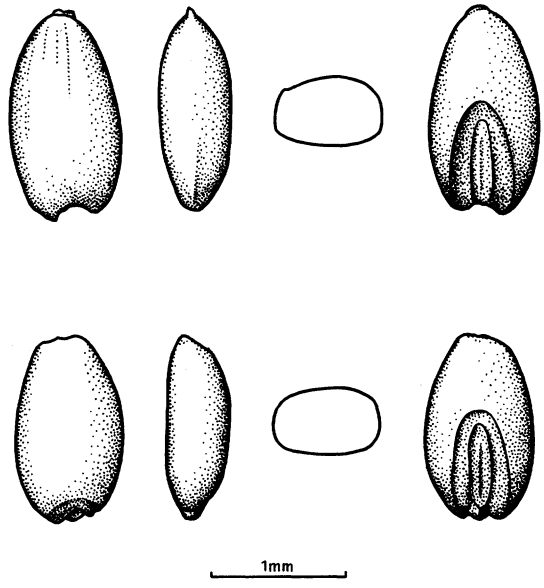

FIG. 7.—*Setaria* spec.

family group could have gathered enough grain to cover the yearly consumption in about three weeks.

WILD BARLEY

Wild barley (*Hordeum spontaneum* C. Koch) is represented in most samples by small numbers of complete or broken seeds. Characteristic of the seeds of *Hordeum spontaneum* are the flat dorsal side, the comparatively small thickness, and the more or less angular cross-section (Fig. 6).

Only eight charred wild barley seeds turned out to be suitable for measurement (Table 3). For comparison the dimensions of ten modern seeds of wild barley collected in the mountains west of Damascus have been taken. It is likely that the modern wild barley, the grains of which are much larger than the Mureybiṭ ones, belongs to the race which, according to Harlan and Zohary,[7] is characterized by extremely large seeds and which is abundant in southwestern Syria and in nothern Jordan and Palestine.

After carbonization, the average dimensions of the modern wild barley grains from Table 3 had changed to 7.67, 2.90, and 1.90 mm., respectively. This demonstrates that

TABLE 3

DIMENSIONS AND INDICES FOR CHARRED *Hordeum spontaneum* FROM MUREYBIṬ AND FOR MODERN SEEDS OF THIS SPECIES

			L	B	T	L:B	T:B
charred seeds	N = 8	min.	3.8	1.5	1.0	252	61
		aver.	5.44	1.89	1.26	290	67
		max.	6.7	2.1	1.6	372	76
modern seeds	N = 10	min.	8.3	2.5	1.2	295	48
		aver.	9.20	2.84	1.55	325	55
		max.	10.4	3.2	1.8	357	64

carbonization of barley grains can cause a considerable decrease in length. Consequently, it is not unlikely that the original length of the Mureybiṭ barley may have amounted to about 6.5 mm. instead of 5.44 mm. on an average. The thickness of the Mureybiṭ barley would have increased appreciably through carbonization.

The Mureybiṭ wild barley could have originated from the vicinity of the site, although it would never have occurred there in large stands. On the other hand, wild barley is common in the foothills and mountains of southestern Turkey, so that it could have been harvested there, just as with the wild einkorn.

OTHER GRASSES

In addition to wild einkorn wheat and barley, small numbers of other Gramineous seeds were found in the Mureybiṭ samples. One type, which is shown in Fig. 7, has been identified as *Setaria* (foxtail grass). The average length, breadth, and thickness of four charred *Setaria* caryopses, which could be measured, amounts to 1.5, 0.95, and 0.55

[7] Harlan and Zohary, *op. cit.*

mm., respectively. Further, one *Bromus* (brome grass) seed could be determined in Sample 3. In Table 1 the other grass seeds are indicated as Gramineae indet.

LEGUMES

Lentil is present in various samples. The minimum, average, and maximum diameter of twenty seeds amounts to 1.8, 2.32, and 2.9 mm., respectively. For wild lentil (*Lens nigricans* Gods.) a diameter of 2–3 mm. is reported, whereas cultivated lentils are on an average larger than 3 mm. Consequently, it is likely that the Mureybiṭ lentils belong to the wild species.

Very probably more than one *Astragalus* species is represented. The size of the carbonized milk vetch seeds, two of which are shown in Fig. 2 (Pl. XIII), right, varies from 1.3 × 1.45 to 2.25 × 2.55 mm. Various *Astragalus* species are presently found in the Mureybiṭ area. Flannery[8] reports that at Ali-Kosh, in the plain of southwestern Iran, many seeds, including *Astragalus*, were recovered, and that those seeds must have been collected intensively by the inhabitants of that site.

A few seeds of bitter vetch (*Vicia ervilia* [L.] Willd.) have been determined. Of various leguminous seeds the genus could not be identified because of poor preservation (*Leguminosae* indet.). The shape and size of some resemble *Pisum* (pea).

OTHER SEEDS

Seeds of knotweed (*Polygonum*) occur in many samples, occasionally even in larger numbers. The shape of most knotweed seeds has been affected seriously by the carbonization. On the basis of a few specimens which are not or only slightly swollen (Fig. 2, left), the Mureybiṭ knotweed seeds are attributed to *Polygonum venantianum* Clem. (= *P. arenarium* Waldst. et Kit.) with some reserve. The charred, triquetrous seeds are 1.2 to 1.6 mm. long.

The disk-shaped catchfly (*Silene*) seeds show a surface pattern of radially arranged ribs and warts. The greatest diameter of these seeds varies from 0.6 to 0.9 mm. It is striking that in Samples 9 and 10, *Polygonum* as well as *Silene* display the greatest numbers.

The Chenopodiaceae include a few seeds of the *Chenopodium album* L. (fat hen) type. The *Galium* (bedstraw) seeds from Mureybiṭ vary in greatest diameter from 1.0 to 1.35 mm.

Special mention should be made of the occurrence of a large number of seeds of *Juncus* cf. *bufonius* L. (toad rush) in Sample 2. As a result of the carbonization these seeds, which are about 0.4 mm. long, are baked together in lumps of hundreds of specimens. The fact that this seed-type is so numerous in this one sample suggests that in spite of its extremely small size it was collected intentionally.

Small nut fragments of *Pistacia* (pistachio) were met with. To-day *Pistacia atlantica* Desf. grows in the mountains of central Syria,[9] while *P. khinjuk* Stocks and *P. atlantica* Desf. var. *kurdica* Zohary (= *P. eurycarpa* Yalt) are native in southeastern Turkey.[10]

[8] K. V. Flannery, "The Ecology of Early Food Production in Mesopotamia," *Science*, 147 (1965), 1247–56.

[9] H. Pabot, "Rapport au gouvernement de Syrie sur l'écologie végétale et ses applications," *FAO Rapport No. 663* (Rome, 1957).

[10] P. H. Davis, Ed., *Flora of Turkey*, Vol. 2 (Edinburgh, 1967).

CHARRED WOOD

In addition to the seeds, the charred wood has been studied under a stereo preparation microscope at between twelve and fifty magnifications. The majority of the charcoal turned out to be of *Populus* (poplar). Also, *Tamarix* (tamarisk) and *Fraxinus* (ash) could be identified. In prehistoric times, the valley of the Euphrates and the islands in the river would have been covered by a poplar forest in which tamarisk, ash, and perhaps a few more tree species were represented.

Summarizing, it can be stated that crops were not grown by the prehistoric inhabitants of Mureybiṭ. On the other hand, they did gather seeds, among others two-seeded wild einkorn, wild barley, and legumes. It is likely that most of the seeds were not collected in the Mureybiṭ area but in the foothills and mountains of southeastern Turkey.